Sunken Continents: Myth and Method in the Study of American Indians (Chicago: University of Chicago Press, [ca. 1962]).

86. Madison U. Sowell gives a good overview of the debates over *View of the Hebrews* in "The Comparative Method Reexamined," although he himself asserts that "no proof exists at present to show that Joseph Smith had a *direct* knowledge of Ethan Smith's work" (53; emphasis added). Others who seem concerned with this question are Robert N. Hullinger (*Mormon Answer to Skepticism* [St. Louis: Clayton Publishing House, 1980], 36, 39, 44-47, 57) and Hugh Nibley ("A Strange Thing in the Land: The Return of the Book of Enoch, Part 2," *Ensign* 5 [Dec. 1975]: 72-76). Robert Paul also seems to feel it is important that Joseph Smith did not read much as a youngster ("Joseph Smith and the Manchester [New York] Library," *BYU Studies* 22 [Summer 1982]: 341-42).

87. Stevenson, "Some Comments on Automatic Writing," 324-25. Stevenson says "there was no question of dishonesty, so far as I could tell."

88. The LDS church *Ensign* publishes faith-promoting stories that express amazement over "an uneducated farm boy [writing] an epic book, this complex and incredible" (Joseph Giacalone, "Growing into the Church," *Ensign* 14 [June 1984]: 64). This argument is also implicit in the question that missionaries sometimes ask their investigators: "Could any man have written this book?" (*The Uniform System for Teaching Families* [Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1973], C-27).

89. Litvag puts it this way: "It doesn't seem possible that a relatively uneducated woman, no matter how ambitious (or tireless) or innately talented, could force-feed herself enough information to so skillfully write a life of Christ that a professional historian of high standing would call it the greatest since the Gospels" (*Singer in the Shadows,* 290).

90. An articulation of this assumption can be found in the introduction to Reynolds, *Book of Mormon Authorship,* 1-3.

91. One area where the Book of Mormon may differ from other automatic texts is in religious doctrine. But to say that the Book of Mormon is scripture because its doctrine is true and that its doctrine is true because it is scripture is hopelessly circular. A bigger problem with the doctrinal criterion is the fact that Book of Mormon teachings sometimes contradict current Mormon theology (see Hale, "Defining the Contemporary Mormon Concept of God"; and Vogel, "The Earliest Mormon Concept of God").

92. For example, both Jane Roberts's and Pearl Curran's works embrace the notion of reincarnation; *A Course in Miracles* expresses a clear disdain for the physical body; the God of *The Urantia Book* is spiritual rather than embodied.

3.

Lamanite Genesis, Genealogy, and Genetics

Thomas W. Murphy

IN MARCH 2000 SCOTT WOODWARD, A PROFESSOR OF MICROBIOLOGY at Brigham Young University, launched a multi-million dollar study funded by philanthropists Ira Fulton and James Sorenson.[1] Their Molecular Genealogy Research Group (MGRG) is compiling a database of DNA and genealogical records that can be used to identify connections between present and past human beings. Applying data from DNA to trace family histories and linkages between populations offers considerable promise to Latter-day Saint genealogists.[2] It also constitutes a boost to broader scientific research into the history and geography of genes, as well as to global migration and world population histories.[3] While the embrace of molecular research at an LDS-owned university may be a welcome development for many well-educated Mormons, this burgeoning interest may also provoke reconsideration of assumptions that have been long held by many, if not most, Mormons.

Some optimism was expressed by church members that such research would vindicate the Book of Mormon as an ancient document. The hope was that DNA would link Native Americans to ancient Israelites, buttressing LDS beliefs in a way that has not been forthcoming from archaeological, linguistic, historical, or morphological research. For those who held such an expectation, the data collected by MGRG and results of similar research projects have been disappointing.[4] So far, DNA has lent no support to the traditional Mormon beliefs about the origins of Native Americans. Instead, genetic data have confirmed that migrations from Asia are the primary source of American Indian origins. This research has substantiated already-existing archaeological, cultural, linguistic, and biological evidence. While DNA shows that ultimately all human populations are closely related, to date no intimate genetic link has been found between ancient Israelites and indigenous Americans, much less within the time frame suggested by the Book of Mormon.[5] Therefore, after considering the research in molecular anthropology summarized here, I have concluded that Latter-day Saints should not realistically expect to find validation for the ancient historicity of the Book of Mormon in genetics. My assessment echoes that of geneticist and former LDS bishop Simon Southerton whose survey of the literature "failed to find anything that supported migration of Jewish people before Columbus" and "no reliable scientific evidence supporting migrations from the Middle East to the New World."[6]

This essay outlines two insights into the geography and history of human genes and their implications for Mormon thought. If the embrace of DNA research has an impact on Mormon views, it will likely propel new approaches to scripture and history already underway in intellectual circles. First, genealogical data inscribed in genes suggest to current researchers that humans and chimpanzees share a common ancestor that lived in Africa between 5 and 7 million years ago. This adds to an abundance of archaeological and other data pointing to the same conclusion and adds to the challenges one encounters in trying to uphold scriptural literalism. Second, new genetic clues are being discovered that confirm scientific views about ancient migration patterns. Ancestors of Native Americans seem to have separated from their Asian neighbors about 40,000-50,000 years ago and from each other in what may have been three or more separate waves of migration 7,000-15,000 years ago. No link between American Indians and ancient Israelites is evident in the data.

DNA AND HUMAN ORIGINS

As readers may know, deoxyribonucleic acid (DNA) consists of a double-stranded molecule containing the genetic code—the major component of human chromosomes that links human beings to all other forms of life on earth. Because of a common evolutionary past, the cells of living organisms share fundamental similarities. Beginning about 1.2 billion years ago, structurally complex eukaryotic cells appeared, containing a variety of structures within the cell membrane. DNA is among the most important of those structures: nuclear DNA, found in the nucleus of the cells, and the more abundant mitochondrial DNA (mtDNA), found outside the nucleus and inherited directly from mothers. Both nuclear and mtDNA share a similar structure but are organized differently.[7] Through comparisons of DNA and mtDNA in populations and across the spectrum of living organisms, scientists have discovered a veritable genealogical record. Often labeled molecular anthropologists, these scientists have begun using genetic markers to chart evolution and migration.[8]

The Third Chimpanzee

Jared Diamond, a professor of physiology at UCLA's medical school, draws upon DNA evidence to support the argument that humans ought to be classified as the third chimpanzee. Scientists have long pointed to anatomical similarities with monkeys and apes for the classification of humans as primates, but analysis of DNA helps us realize just how closely related we are. Monkeys share an impressive 93 percent of their genetic code with humans, while apes and humans share at least 95 percent; humans and chimpanzees share an astounding 98.4 percent. The genetic difference between us and chimpanzees (pygmy and common) is less than between common gibbons and siamang gibbons. It is also less than between closely-related North American bird species such as the red-eyed vireos and white-eyed vireos. Diamond concludes that "we are just a third species of chimpanzee" and that "our important visible distinctions from the other chimps—our upright posture, large brains, ability to speak, sparse body hair, and peculiar sexual lives—must be concentrated in a mere 1.6 percent of our genetic program."[9]

African Origins

DNA not only confirms our genetic relationship with chimpanzees and gorillas but points to Africa as the birthplace of humanity, supporting the fossil record. Analysis of protein immunological data suggests that humans and chimpanzees shared a common African ancestor 5-7 million years ago.[10] Fossils from the genera *Australopithecus* and *Ardipithecus* show that multiple species of ancient hominids with chimp-like brains walked on two feet between 6 million and 1 million years ago.[11] The emergence of a larger-brained hominid *Homo habilis* around 2 million years ago is followed by that of *Homo erectus* and archaic *Homo sapiens* around 1.7 million and 500,000 years ago, respectively. These species spread from Africa throughout much of Europe and Asia. The first fully modern human fossils date from Africa at about 100,000 years ago and from Europe, Asia, and Australia at about 40,000 years ago. Scientists vigorously debate whether the evolution to *Homo sapiens sapiens* was a gradual multiregional transition throughout the Old World or whether fully modern *Homo sapiens,* emerged from its place of origin to displace regional archaic species like the Neanderthals found in Europe and western Asia.[12]

In fact, the biggest impact that molecular anthropologists have made occurred in the rivalry between the multiregional view and that of a modern emergence out of Africa. Allan C. Wilson, Rebecca L. Cann, and colleagues utilized mtDNA of living humans to construct a genealogy that indicated a common female ancestor in Africa less than 200,000 years ago.[13] This provoked a discussion about the applicability of mtDNA data to issues of evolution. Paleoanthropologists Robert Corruccini and Glenn Conroy criticized the assumptions and simplifications in this approach.[14] However, the early findings have been substantiated by more thorough analyses of mitochondrial genome variation and by several population studies of nuclear DNA which show more genetic variation in Africa than elsewhere, indicating an African origin for all humans.[15] The recent extraction of DNA from Neanderthal fossils lends further weight to the out-of-Africa hypothesis. These studies found that the mtDNA of Neanderthals falls outside the range of variation found in modern humans and that Neanderthal and human lineages split about 600,000 years ago.[16] Further analysis of mtDNA and nuclear DNA by Alan R. Templeton of Washington University confirmed a recent migration from Africa (ca. 80,000-150,000 years ago) but indicated that it was characterized by some interbreeding and not complete replacement of at least one earlier human expansion out of Africa (ca. 420,000-840,000 years ago).[17]

Stanford geneticist Luigi Luca Cavalli-Sforza has synthesized data from blood groups and protein polymorphisms (proteins occurring in different forms) to calculate genetic distances between populations. By comparing genetic dates to those derived from archaeology and linguistics, he was able to prepare a model of global human colonization. According to his calculations, modern humans first entered Asia approximately 100,000 years ago. They spread from Asia to Australia approximately 55,000 years ago and to Europe approximately 43,000 years ago. The data are less conclusive about the exact timing of the migration from Asia to the Americas, but an Asian origin is clearly indicated and the possible time frame stretches from 15,000 to 50,000 years ago. A closer comparison of Amerindians and East Asians, as opposed to all Asians, suggests a possible date for the first settlement of America approximately 32,000 years ago.[18]

The Mormon Context

Biblical historicity was central to Mormon theology from its inception. When the Book of Mormon was published in 1830, early America was embroiled in debates about the role of scripture in an age of skepticism and reason. The existence of two New World continents with people who were unaccounted for in the Bible caused a theological crisis in Christianity beginning in the early sixteenth century.[19] Questions about the historicity of the Bible were rampant both in European and early American intellectual circles. In 1794-95 Thomas Paine wrote an influential series of pamphlets entitled *The Age of Reason* that defended the reasonableness of belief in God but portrayed the Bible as mythology and hearsay.[20] The Joseph Smith family, like others, found themselves embroiled in this controversy. Asael Smith confronted his son Joseph Smith Sr. with a copy of Paine's book when he heard that his son was attending Methodist services. Lutheran minister Robert N. Hullinger has sympathetically written a portrait of this debate and its impact on the Smith family and Mormon theology. He believes that the Book of Mormon and parts of the Pearl of Great Price and the Doctrine and Covenants constituted Joseph Smith Jr.'s response to this skepticism.[21] In an 1842 letter, the Mormon founder stated his position on these issues when he declared "the bible to be the word of God as far as it is translated correctly" while claiming a higher status for the Book of Mormon as "the word of God."[22] But Smith's tendency to read the Bible in literal terms is also evident in his designation of Independence, Missouri, as the site of the original Garden of Eden.[23] In the context of this debate, the Book of Mormon defended literal readings of the Bible against the onslaught of rationalism while validating some of the concerns of skeptics about inaccuracies in the Bible.

Internal debate on the Bible and human origins, fueled by Charles Darwin's publication of *On the Origin of Species* in 1859, has generally shown LDS scholars and some church authorities to be in support of science.[24] Brigham H. Roberts, an LDS authority who supported pre-Adamic life and the antiquity of the earth, stood out as an early spokesperson for the harmonization of science and theology.[25] His approach found sympathy and support from such LDS authorities as Apostle John A. Widtsoe, President David O. McKay, and First Presidency counselor Hugh B. Brown. More recently, such leaders as Apostles Mark E. Peterson and Bruce R. McConkie and church presidents Harold B. Lee and Ezra Taft Benson have taken a stand against what they see as the dangers of science and of evolution in particular.[26] LDS sociologist Armand L. Mauss has noted a trend among Mormons towards Protestant fundamentalism in the latter part of the twentieth century.[27] Despite this trend, the LDS First Presidency has not taken a definitive stand for or against evolution.[28] This is encouraging for the many young Mormons embarking on careers in science and seeking ways to resolve tensions between their academic careers and personal spirituality. Attempts by Latter-day Saints to balance these perspectives can be found in such publications as *Brigham Young University Studies*, *Dialogue: A Journal of Mormon Thought,* the *FARMS Review of Books*, and *Sunstone.*[29] Perhaps the new genealogical data extracted from genomes may propel the LDS leadership to acknowledge the possibility of God's hand in science and evolution, as the Catholic leadership has done.[30] This would imply a more liberal interpretation of not only the Bible but also of the revelatory texts that defend biblical literalism.

MOLECULAR ANTHROPOLOGY AND NATIVE AMERICAN ORIGINS

To date, molecular anthropology has not provided support for the Book of Mormon as a history of ancient America. Non-LDS scientists have long considered the book's view to be inconsistent with the archaeological record.[31] In 1973 Michael Coe, an archaeologist at Yale University, pointed to Joseph Smith's inability to "read 'Reformed Egyptian' or any other kind of hieroglyphs," observing:

> There is an inherent improbability in specific items that are mentioned in the Book of Mormon as having been brought to the New World by Jaredites and/or Nephites. Among these are the horse (extinct in the New World since about 7,000 B.C.), the chariot, wheat, barley, and metallurgy (true metallurgy based upon smelting and casting being no earlier in Mesoamerica than about 800 A.D.). The picture of this hemisphere between 2,000 B.C. and A.D. 421 presented in the book has little to do with the early Indian cultures as we know them, in spite of much wishful thinking.[32]

For similar reasons, LDS archaeologists Dee F. Green and Deanne G. Matheny have been critical of naïve attempts to link the Book of Mormon to archaeological sites.[33] Life-long efforts by Brigham H. Roberts and Thomas S. Ferguson to use archaeological evidence to corroborate the Book of Mormon ended in personal disillusionment.[34] Genetic evidence poses similar difficulties. When asked about DNA evidence, Michael Crawford, a biological anthropologist at the University of Kansas, stated: "I don't think there is one iota of evidence that suggests a lost tribe from Israel made it all the way to the New World. It is a great story, slain by ugly fact."[35] Oxford geneticist Bryan Sykes and Russian geneticist Miroslava Derenko have both substantiated Crawford's conclusion through agreement that "the Indian gene pool is Siberian, not Middle Eastern."[36]

Crawford's conclusions in *The Origins of Native Americans: Evidence from Anthropological Genetics* show why he rejects Mormon claims. Genetic similarities, morphological resemblance, craniometric affinities, and cultural similarities between Asians and New World populations led him to conclude, "This evidence indicates extremely strong biological and cultural affinities between New World and Asian populations and leaves no doubt that the first migrants into the Americas were Asians, possibly from Siberia."[37]

Following this statement, he acknowledges that "[t]his evidence does not preclude the possibility of some small-scale cultural contacts between Amerindian societies and Asian or Oceanic seafarers." Despite this cautious qualification, his work shows that Amerisraelite Lamanites could not possibly have been the "principal ancestors of the American Indians," as claimed in the current introduction to the Book of Mormon.[38] If there was contact with other people, he has yet to see evidence of this, although the evidence has not ruled out the possibility of limited encounters.

As Crawford indicates, the current data showing an affinity between Native American and Asian populations are abundant. For instance, he lists more than a dozen alleles for blood proteins unique to New World and Asian populations and identifies additional genetic systems which are not exclusive to them but occur at different frequencies elsewhere. These include "the human leukocyte antigen (HLA) system, the various blood groups, and even the mitochondrial DNA (mtDNA) Asian haplotypes." Amerindian and Siberian populations seem to "share a genetic predisposition to otitis media," a middle ear infection.[39] Such findings substantiate the archaeological, linguistic, anatomical, and physiological studies that show an Asian origin for America's first inhabitants.

Mitochondrial DNA (mtDNA)

Native Americans were among the first humans studied for mtDNA variation. In fact, some of the most revealing research into Indian origins comes from these data. Begun in 1985, the research identified a frequent (40 percent) polymorphic genetic marker in Pima-Papago of southern Arizona, also uniquely present, though in low frequency, among East Asians. A second study of mtDNA variation in 1990 found that the Pima-Papago, Yucatan Maya, and the Ticuna from Brazil all shared high frequencies of the same genetic marker. Researchers identified four unique mtDNA families in these three populations and concluded that despite their distance from each other, they were closely related and most likely all came from the same founding population.[40] In the following years, research has confirmed that "almost all Native American mtDNAs (about 98 percent) were defined by one of four sets of specific mutations and clustered in four well-defined groups of haplotypes which were termed 'haplogroups.' The four haplogroups were termed A, B, C and D."[41]

Stanford linguist Joseph Greenberg entered the discussion in 1987 with a study of Native American languages. Initially his findings appeared alongside, but are now deeply imbedded in, the study of Native American genetics. Greenberg proposed that Native American languages could be divided into three families: Amerindian (comprising most languages of North and South America), Na-Dene (comprising Navajo, Apache, and languages spoken in the Pacific Northwest), and Eskimo-Aleut.[42] Cavalli-Sforza added that a significant correlation can be found between the dendrograms (family tree classifications) of genetic and linguistic evidence.[43] Other linguists generally accepted Greenberg's classifications of Eskimo-Aleut and Na-Dene language families but objected to lumping the remaining languages into a single Amerindian family.[44] Yet a recent publication by Cavalli-Sforza showed correlations between Greenberg's linguistic classifications and his own genetic ones. He found that "Amerindians are genetically extremely variable and the [traditional] linguistic subgroupings within the Amerindian family do not correspond terribly well with the genetic results."[45] This indicated an Amerindian migration, or possibly multiple migrations, at least 30,000 years ago, older and more complex than those of later Na-Dene and Eskimo-Aleut speakers.[46]

Data subsequently gathered from more than six dozen Native communities and thousands of individuals from North, Central, and South America demonstrate that Amerindian populations generally contain all four mtDNA haplogroups. Important exceptions include the populations of lower Central America where only haplogroups A and B are present. Speakers of Na-Dene languages, likely products of a later migration, tend to have only haplogroup A. Haplogroup B, common among East Asians, Polynesians, and Amerindians, is found in low frequencies among Siberians, Eskimos, and Na-Dene speakers. This anomaly initially suggested the possibility of multiple migrations. The first would have been a population with haplogroups A, C, and D, the second may have carried haplogroup B, and the third would have been Na-Dene speakers. Oxford geneticist Bryan Sykes has suggested that the peculiar distribution of haplogroup B may be "the genetic echo of a second seaborne colonization that took the coastal route north up the coast of Asia and down the Pacific coast of North America" approximately 12,000-13,000 years ago. This wave of migration may have been prompted by the same post-Ice-Age environmental changes which launched a distinct branch of the same haplogroup from coastal China or Taiwan to colonize the Polynesian islands.[47] Italian geneticist Antonio Torroni estimates that the first migration occurred between 34,000 and 26,000 years ago, the second between 15,000 and 12,000 years ago, and the third 10,000 to 7,000 years ago. More recent analysis of the control region of mtDNA found support for an early arrival of all haplogroups. It is possible that "all Native

Americans derive from a single source population which colonized Beringia [now occupied by the Bering Sea] possibly around 30,000 years ago." The first migrants from Beringia would have given rise to Amerindians and subsequent migrations to the Na-Dene and Eskimo.[48] While researchers dispute the exact timing, number, and origin of migrations, there is virtual consensus that they began in Asia.

Haplogroup X

The mtDNA evidence initially appeared to leave room for a more complex picture of migrations. While about 98 percent of Native Americans are descended from one of the four haplogroups A-D, approximately 1 percent carry markers from a haplogroup, now designated X, that does not belong to the A-D categories. Prior to understanding European mtDNA, researchers speculated that this fifth haplogroup may have originated from recent admixture from Europeans. On the results of recent research, Torroni observes:

> Among Native Americans, haplogroup X appears to be essentially restricted to northern Amerind groups, including the Ojibwa (25 percent), the Nuu-Chah-Nulth (12 percent), the Sioux (15 percent), and the Yakima (5 percent), although it was also observed in the Na-Dene-speaking Navajo (6 percent). Substantial sequence differences exist between the Native American and European mtDNAs. Median network analysis showed that European and Native American haplogroup X mtDNAs are related yet (nearly) disjoint from each other, and that considerable genetic substructure exists within both groups. Thus, the presence of this haplogroup in North America cannot be attributed to recent admixture with Europeans. Estimates of the coalescence time of these mtDNAs in the Americas range between 12,000 and 36,000 years ago, indicating that haplogroup X represents an additional founding mtDNA lineage in Native Americans.[49]

Haplogroup X can be found in low frequencies in Europe, the Near East (including Israelis), and North America. Until recently, it was thought to be absent from living eastern-central Asian, Siberian, Central, and South American populations.[50] Summarizing research to date in 2000, Torroni proposed "that some Native American founders could have been of Caucasoid ancestry and haplogroup X might have been brought, directly or indirectly, to Beringia/America by the eastward migration of a 'Caucasoid' population which apparently did not contribute to the maternally derived gene pool of modern Siberian/East Asian populations."[51] Geneticist Theodore Schurr reported the presence of haplogroup X not only in "two Pre-Columbian North American populations" but also in "a few ancient Brazilian samples."[52] Because of variations within the Native American haplogroup that distinguish it from the European types, Michael D. Brown and colleagues dated its arrival in North America to 12,000-36,000 years ago.[53] Sykes's research echoes this timing and interpretation, tracing X's origin to the borders of Europe and Asia approximately 25,000 years ago, with an early separation into distinctive branches, one of which gave rise to the European and the other to the Asian/Native American matrilineages.[54]

The discovery of a rare haplogroup apparently linked to the Near East sparked the interest of some Latter-day Saints, even though it posed considerable difficulty for the chronology and geography of the Book of Mormon. The timing of its entry predates Book of Mormon events by thousands of years, and its distribution challenges both the traditional hemispheric Book of Mormon geography and the more recent limited geography in Central America posited by Foundation for Ancient Research and Mormon Studies (FARMS) researchers. The X variant neither appears spread across the American continents nor is it limited to a select Central American region.[55] A FARMS editorial noting the "European-like" characteristics associated with X suggested that it "may not be the last new haplogroup to be winnowed from the residual 'other' category." The editorial pointed to the possibility of haplogroup H (common among Europeans) among Maya Indians as an example of the complexity of the data and a caution against simplistic interpretations.[56] While the warning is a worthy one, most geneticists attribute the occasional presence of European haplogroups H and J and African haplogroup L to intermarriage with recent immigrant populations.[57] The identification of haplogroup X among Altaians from South Siberia in 2001 by Miroslava V. Derenko and colleagues invalidated Torroni's earlier speculations of a Caucasoid ancestry of haplogroup X because of its apparent absence, at that time, from Siberian/East Asian populations.[58] This new research confirms an ancient route of an X matrilineage branch across Asia, through Siberia, to the New World. Ultimately, as Derenko told a reporter from the *Financial Times*, the existence of haplogroup X does not constitute a linkage between ancient Israelites and American Indians much less within the time frame or geography suggested by the Book of Mormon.[59]

Y-Chromosomes

Mitochondrial DNA, inherited from a maternal lineage, provides only one method of investigating human genealogy. On the chromosomal level, men and women differ in that women possess two X-chromosomes and men have both X- and Y-chromosomes.[60] Because the Y-chromosome is inherited paternally, this offers an alternative investigative tool.

The Y-chromosome substantiates many conclusions already drawn from mtDNA, archaeology, and linguistics.[61] Its worldwide distribution and frequency provide support for an African origin for all humans[62] and for an Asian origin for Native Americans, probably a central Siberian origin. The earliest studies identified one major haplotype (defined as the DYS199 T allele) in southern and central Amerindians in frequencies above 90 percent, indicating a strong genetic homogeneity and common foundational population. It was found in lower frequencies among Eskimo and Na-Dene speakers and in far northeastern Siberians, possibly the result of back migration across the Bering Strait. Intermediate Y haplotypes of the kind that may have given rise to this major Native American marker have been found in Siberia.[63] Another recent study identified a second major founder haplotype in North, Central, and South American populations. Geneticists T. M. Karafet and colleagues labeled the earlier discovery (DYS199 T) haplotype 1G and the new one haplotype 1C. While 1C is found among Native Americans, Asians, and Europeans (2.3 percent), it reaches its highest frequencies outside of the Americas in Siberia. Another possible founder haplotype, 1F, appears most frequently in Siberia and Mongolia but not in Europe.[64] While the investigation of Y-chromosome lineages is not as far along as that of mtDNA, early results continue to substantiate much of what is already known from the other genetic markers and from archaeology, morphology, and linguistics.

Ancient DNA (aDNA)

Most studies in molecular anthropology have been conducted on living populations. While they are valuable in helping to identify the migration patterns of our ancestors, they only tell part of the story. Recent developments, including the invention of Polymerase Chain Reaction (PCR) in the mid-1980s, have made it possible to extract and analyze DNA from ancient fossil remains.[65] One of the most exciting results of this emerging field was the recent extraction of DNA from three Neanderthal skeletons. Another recent study linked the prehistoric Anasazi of the southwest United States to the modern populations of Pueblo Indians.[66] Studies of Anasazi, Fremont, and Oneota all show continuity between ancient and modern populations and continue to support Asian origins.[67]

Of most interest to Latter-day Saints might be the study of ancient Maya skeletons from Copán, Honduras. A team of geneticists led by D. Andrew Merriwether from the University of Michigan extracted DNA from nine skeletons and compared the results with living populations. They found that all nine individuals had belonged to mtDNA haplogroups C or D, thus indicating connections to living native populations. Yet, living Yucatec Maya are predominately from haplogroups A and B. Despite the apparent differences between these two Maya populations, which are widely separated by geography and time, the authors caution against reading too much into this small sample. Preliminary data indicated that several additional individuals who could not be fully typed were neither C nor D. Despite the additional clues about genetic patterns that this technology offers, it is as yet hampered by low extraction rates and the low frequency of most population-specific polymorphisms that would permit closer identification with modern populations.[68]

Israelite DNA

Population-based studies of Asians and Native Americans show statistically clustered, shared genetic markers between Native Americans and Asians.[69] Markers on the Y-chromosome, nuclear DNA polymorphisms and various types of mtDNA have also been used to cluster and chart relationships among Jews in Europe, Asia, and Africa. For instance, they have provided evidence of Jewish connections among probable Spanish-American descendants of *conversos*, the Spanish Jews forcefully converted to Christianity in the fifteenth century.[70] Studies using global databases examining a multitude of different markers have consistently failed to show a statistically significant clustering of indigenous Americans with Near Eastern, Israelite, or Jewish groups. However, LDS anthropologist John L. Sorenson, proponent of a limited geography of the Book of Mormon in Central America, has previously speculated that one should find as much or as little interaction, culturally and genetically, between Israel and ancient America as could be found among Israelites and the peoples of Eurasia.[71] If Sorenson is correct, then we can contrast the lack of evidence of an Israelite genetic presence in the Americas with actual clustering of genetic markers in Old World populations claiming a Jewish ancestry.

Researchers have uncovered distinctive genetic markers on the Y-chromosome that are useful in establishing linkages between ancient and contemporary Hebrew populations. Within the modern Jewish religion, there are three patrilineal castes that genetic anthropologists Neil Bradman and colleagues describe thus: "The Priests (Cohanim, singular Cohen), non-Cohen members of the priestly tribe (Levites), and Israelites (non Cohanim and non-Levites)." Notice that the term Israelite, as they use it, constitutes a subgroup "who are neither Cohanim nor Levites." While the priestly castes are present in most Jewish communities, one becomes a Jew through matrilineal heritage—that is, by being born to a Jewess—or through conversion. Thus "Israelite" haplotypes are diverse, with only the Cohen modal haplotype, out of genetic markers analyzed in this study, appearing in "Israelites" more frequently than 0.1 (14 out of 119). The Cohen haplotype is much more frequent in both Ashkenazic and Sephardic Cohanim (0.509, n = 54) than in Levites (0.037). Despite different understandings of the terms Jew and Israelite than Mormons hold, Bradman and colleagues date the origin of the Cohen haplotype to 2,100 to 3,250 years ago, putting it within the historical range of the alleged Lehite and Mulekite migrations to the New World. He concludes that it can "be useful for testing hypotheses regarding the relationship between specific contemporary communities and the ancient Hebrew population."[72]

Neil Bradman and Mark Thomas have used the Cohen haplotype to link ancient Hebrews to the modern population of the Lemba, a black, southern African, Bantu-speaking population with oral traditions asserting a Jewish ancestry. The researchers note that "claiming Jewish origins is not an unusual phenomenon: the myth of the lost tribes is a powerful story and many groups have claimed to be descendants of one or other of the tribes or have been put forward for that honor."[73] Claims regarding an Israelite ancestry for Native Americans would fit into this category, but DNA tests of the Lemba yielded a strikingly different outcome than for Native Americans. Two studies to date have demonstrated that one of the Lemba clans carries a high frequency of "a particular Y-chromosome termed the 'Cohen modal haplotype,' which is known to be characteristic of the paternally inherited Jewish priesthood and is thought, more generally, to be a potential signature haplotype of Judaic origin."[74] An additional study by Michael F. Hammer of the University of Arizona and colleagues in Europe and Africa has found considerable genetic continuity and a common pool of markers on the Y-chromosone shared by Middle Eastern Arabs and descendants of the Jewish Diaspora despite long-term residence in various parts of Europe, Asia, and Africa. At these markers, the Lemba showed more intermarriage with local populations than other members of the Jewish Diaspora but still clustered halfway between sub-Saharan Africans and others Jews.[75] Both Bradman and Tudor Parfitt have also publicly noted the lack of a comparable link between Native Americans and ancient Israelites.[76]

SHIFTING FOUNDATIONS

Evolution presents a minor challenge to popular Mormon beliefs in comparison to the problems posed by the scientific view of ancient America. New genetic evidence adds to an already impressive amount of linguistic, archaeological, cultural, biological, anatomical, and psychoanalytic data that challenge the traditional Book of Mormon view. That view includes the belief that the Lamanites described in the text are the "principal ancestors of the American Indians."[77] Remarkably, most Latter-day Saints are unaware of the many reasons why the scientific community rejects that claim.

The Book of Mormon's antiquity has been questioned since its publication in 1830. Among LDS scholars today, one can find individuals on either side of the issue, some of whom think that it is time to separate acceptance of the book as scripture from belief in its ancient origin. Others doubt that the book accounts for all or even most Native Americans and therefore propose a limited geography in Central America. Both groups reject a literal reading and agree that Nephites and Lamanites never actually rode horses, traveled in chariots, used steel swords, raised cattle, or ate wheat and oats.[78] FARMS has played a role in offering revisionist interpretations that seek to reconcile faith with science. But the DNA research may make this effort more difficult as the views of intellectuals and those of traditional Mormons continue to diverge.

Limited Geography

The difficulties in trying to link the Book of Mormon to ancient populations have prompted some LDS scholars, especially those associated with FARMS, to reinterpret Lamanite identity in the latter part of the twentieth century. Rejecting the hemispheric views of previous generations and of most contemporary Mormons, Sorenson proposed a limited geography around the Isthmus of Tehuantepec in Central America. He interpreted the Book of Mormon as a lineage history comparable to the *Popol Vuh* of the Quiché Maya rather than a hemispheric history as most Mormons have understood it, explaining that "the Book of Mormon is a partial record of events, emphasizing what happened to one group of people, put in their own ethnocentric terms, in the midst of other peoples each with its own version of events."[79]

If the events described in the Book of Mormon took place in a small setting in Central America, then where would an investigator look for genetic evidence of Israelites? FARMS scholar William Hamblin believes that "Lamanite" simply means "non-Nephite," a cultural rather than a biological designation: "Lamanite is not a genetic designator requiring us to insist that all inhabitants of the New World are genetically descended only from the Lehite colony." In this respect, he declares, "all modern Native Americans can be accurately described as cultural or political Lamanites, since they are non-Nephites."[80] By this logic, Hamblin himself, a non-Nephite, would be a Lamanite. So, one needs more specific criteria for distinguishing genetic Lamanites from cultural non-Nephites. Sorenson, too, is comfortable with the idea that "all native peoples of the New World may be appropriately classified 'Lamanites.'" He quickly clarifies that this says nothing about "'literal' descent." Like Hamblin, he expresses optimism that Lehite genes and ideas may eventually be found, but he cautions that the impact on the surrounding culture as Lehites spread out from Central America would have been "minor, culturally or biologically." Yet he identifies several places where significant movements of Mesoamerican peoples and ideas took place. These include northern Mexico, Arizona, New Mexico, and the southeastern United States: "Ecuador in the time of the Jaredites, and Peru, Ecuador, and Colombia at several later times, also felt the impress of Mesoamerican life and probably of the genes of its peoples."[81]

The social and historical variability of meanings for ethnic labels demands that one pay careful attention to the differences between biology and culture, as evident in the studies of the Lemba, the African tribe with established linkages to ancient Hebrews. The meaning of the term Israelite, like that of Lamanite, is variable over time and place.[82] Bradman and Thomas exercised considerable caution in their attempts to tie cultural categories to biological markers. Ultimately, they identified the Lemba's heritage through a paternal priestly lineage with a distinctive genetic marker on the Y-chromosome substantiated later by other researchers using additional Y-chromosome markers. Quests for Lamanite DNA are hampered by the absence of ancient historical sources that might substantiate or clarify the cultural classifications made in the Book of Mormon.

While FARMS researchers are careful to note the importance of cultural influences on the construction of categories, they express confidence in an Israelite genetic presence in Central America and perhaps as far away as Arizona to the north and Colombia to the south. As we have seen, genetic studies of indigenous peoples throughout North, Central, and South America have failed to link Native Americans from these locations to ancient Hebrews. At the same time, careful genetic studies in the Old World have proven capable of linking the Lemba of southern Africa to ancient Hebrews.

A Galileo Event

Recently an anonymous editorial addressing the "Problematic Role of DNA Testing in Unraveling Human History" appeared in the *Journal of Book of Mormon Studies.*[83] The editorialist urged against simplistic identification of Israelites with skin color and physical features. Accompanying the column was a set of photographs that illustrated the physical variation among modern "Jews." Readers were encouraged to approach "new light" from DNA with a skeptical eye and reminded that meanings applied to molecular data come from scientists, not from the DNA. While such critical thinking is a part of scientific inquiry, the anonymous author disparaged the value of molecular research, calling it a "new toy in human biology and anthropology," and dismissed molecular reconstructions of human history as "temporary, even faddish." In doing so, the writer exaggerated the impact of criticisms Rebecca Cann and colleagues received following their analysis of variation of mtDNA in living populations. Subsequent studies supported Cann's interpretation and confirmed a recent migration of modern humans out of Africa; this was not acknowledged in the editorial. Despite the general skepticism regarding DNA research that was urged in the editorial, the writer noted that "the DNA data has decisively confirmed" the Lemba traditions of Jewish ancestry, followed by a favorable report on speculations about low levels of gene flow between American Indians and Polynesians by Dr. Rebecca Cann–the very person whose more substantiated work on African origins the editorial cast doubt upon. This selected attention to a few instances of gene flow from South America to Polynesia misled readers by avoiding Sykes's "crystal clear" conclusion of Polynesian mtDNA of an ancestral origin in coastal China or Taiwan approximately 20,000-30,000 years ago.[84]

Perhaps the most troubling aspect of the article was its failure to provide a summary of the status of current research or to address the ethics of the research it proposed. It raised a question that will linger in many readers' minds: "So is there evidence from DNA studies of populations in America having Near Eastern/Jewish characteristics?" The author avoided answering by shifting to a hypothetical discussion between a philanthropist wanting to fund DNA research and a molecular expert. In this speculative encounter, the scientist discourages interest by raising questions about the efficacy of such studies. These include the likelihood of biological change in America and the Near East over 2,600 years from the time of Lehi, the possibility that Lehi's party was not genetically typical of Jews in Jerusalem at the time, problematic linkages between ethnicity and biology, the impact of intermarriage between Lehi's descendants and indigenous Americans, difficulty identifying direct descendants of Lehi, and only a "distant chance that someday we might know enough to identify [even] one group in Central America" through cultural and linguistic ties to the Near East. In an echo of the kind of ambivalence evident in the first half of the article, the author then ends by recommending the study of a mysterious group of Mexican Indians of purported Jewish origin identified by Raphael Patai in the 1930s but apparently unknown to any other researcher.

In a web-based article on "DNA and the Book of Mormon," Cooper Johnson from the Foundation for Apologetic Information and Research (FAIR) similarly dismisses the relevance of genetic research for interpreting the Book of Mormon.[85] Based on an oral presentation by BYU geneticist Scott Woodward at the 2001 FAIR Conference, Johnson concludes that current data from mtDNA "gives us absolutely nothing with which to base our conclusions as to the validity of the Book of Mormon." Like the FARMS editorialist, Johnson fails to summarize the data uncovered to date while nonetheless emphasizing its incompleteness and urging caution against jumping to hasty conclusions. He minimizes the importance of mtDNA and the Y-chromosome in one's genetic makeup relative to autosomal (non-sex linked genes or markers on the nuclear DNA) and emphasizes current difficulties involved in the extraction of ancient DNA. He accepts the "overwhelming" evidence that the Americas were occupied well before Lehi's reported arrival, and he uses the limited geographic framework to stress the small impact that Lehi's party would have had on a much larger population. He then incorrectly suggests that if a mother bears no daughters, her mtDNA "effectively comes to a screeching halt." This scenario would be true only if all the mother's sisters, cousins, and others who shared copies of the same mtDNA failed to have children. Most importantly, Johnson insists that attempts to test the validity of the Book of Mormon using only mtDNA are based on "an unsound and unacceptable hypothesis" because they beg the question of Lehi's genetic make-up. He fails to note that only the women in Lehi's party would have passed their mtDNA to succeeding generations. Regardless of this oversight, the critical point that Johnson is making is that a test of the validity of the Book of Mormon using genetic data needs to begin with some conception of the genetic makeup of Lehi's party, a task he sees as impossible.

After publication of the FAIR summary in 2002, Scott Woodward, founder of BYU's MGRG, clarified his view with respect to Johnson's article. Despite noting that much work on population genetics of the Americas is yet to be done, it would not surprise Woodward if geneticists ultimately failed to find any traces of mtDNA from Lehi's party, Jaredites, or Mulekites. He confirmed my critique of Johnson's claims by noting that if a woman without children had sisters, the copy of the grandmother's mtDNA would still be in the population. Woodward expressed his belief that people from the Book of Mormon would have made a "very small" contribution to the gene pool "compared to the pre-existing mtDNA in the Americas." Woodward advocates testing the Book of Mormon "on internal evidences" and believes that the presence or absence of genetic linkages to the Near East in the Americas is neither proof nor disproof of the Book of Mormon.[86]

The methodological concerns raised at FARMS, FAIR, and MGRG are comparable to those addressed and surmounted by Bradman, Thomas, and colleagues in their study of the Lemba and whose success offers hope to the anonymous editorialist that FARMS, or perhaps MGRG, can likewise identify a group in Central America with cultural and linguistic parallels that could be tested. The FARMS and FAIR authors exaggerate the likelihood of biological change in the Americas over the past 2,600 years. They are apparently unaware of research by Dennis O'Rourke of the University of Utah that revealed the tendency of ancient American mtDNA to reflect the same patterns of distribution evident in contemporary indigenous populations.[87] Furthermore, both articles fail to acknowledge the common pool of markers on the Y-chromosome shared by Jewish and non-Jewish populations in the Middle East and their continuity in widespread communities of the Jewish Diaspora.[88] Contrary to the views expressed by these authors, it is not necessary to know the exact genotype of Lehi, Sariah, or other members of their party, only to reasonably conclude that they would have been more like Jews and non-Jews in the Middle East than like Siberian populations in Asia.

In their welcome but unsatisfying attempts to provide plausible explanations for the lack of genetic evidence for Israelites in the Americas, both authors and BYU's leading geneticist implicitly reject long-standing popular Mormon beliefs, including those held by Joseph Smith, about Lamanites being the ancestors of today's American Indians. This shift in the foundations of Mormon beliefs about Indians, termed a "Galileo event" by Brent Metcalfe, may prove to be the most important historical result of wrestling with genetic data.[89]

Ethics of Genetic Research

The organization of the Human Genome Diversity Project (HGDP) in mid-September 1993 led to an outcry that it was being organized without the consultation of indigenous peoples. The HGDP sought the collection of molecular data to chart the history and geography of the human species. The dissent was aired in a public statement on 20 October 1993 from the South and Mesoamerican Indian Information Center (SAIIC) which questioned the ethics of research without oversight from the peoples whose genes would be subject to collection and study. This resulted in limited public research funds for the HGDP. Although SAIIC recognized the potential health benefits of genetic investigations, it also saw potential abuses.[90] With its large private endowment, the MGRG is less dependent upon public funding and oversight than the HGDP. Even though it is subject to the Human Subjects Institutional Review Board at BYU, the MGRG has been criticized for circumventing local ethics review in New Zealand.[91]

Prominent Native American scholars have raised ethical concerns related to the Book of Mormon and genetic research at BYU. Cherokee Jace Weaver at Yale University objects to the Book of Mormon as a perpetuation "of the old slur that Native Americans were descendants of the Ten Lost Tribes of Israel, a belief perpetuated by those who could not accept that indigenous peoples could develop any degree of 'civilization' without fertilization from the Old World."[92] In an article from *Financial Times* reprinted on the front page of *Indian Country Today*, Tom Goldtooth of the Indigenous Environmental Network referred to Mormon evangelism and plans by FARMS to pursue evidence of a genetic link between American Indians and ancient Israel as "ethnocidal indoctrination"; he promised to take appropriate action should such efforts continue.[93] While current research indicates the unlikelihood that FARMS will push such a claim, the potential use of genetic data to advance a view that many Native people find invasive and racist is a concern that will need to be addressed more thoroughly in the future at BYU.[94]

CONCLUSION

Before the emergence of molecular anthropology, John L. Sorenson anticipated the utility and futility of the types of molecular tests that are now available:

> Should some investigator find new methods to pursue research on the "blood lines" of a particular individual, family, or people, he or she might

> find that some native Americans are directly descended from Nephites of ancient times, that some are descended in part from others in Lehi's or Mulek's parties, that some are of Jaredite origin, and that still others have no discernible connection to any of those. Scientific, genealogical, or historical methods are not available; but more important, the scriptures indicate that the results would not matter as far as the Church and the gospel are concerned.[95]

Now that quantitative scientific methods can indeed test for an Israelite genetic presence in ancient America, we learn instead that virtually all Native Americans can trace their lineages to the Asian migrations between 7,000 and 50,000 years ago. While molecular anthropologists have the technological capability to identify descendants of ancient Hebrews, no traces of such DNA markers have appeared in Central America or elsewhere among Native Americans. Ultimately, as Sorenson noted, these findings may not matter to Latter-day Saints, who have a spiritual witness of the truth of the Book of Mormon. Yet, the discoveries caution against confusing a spiritual witness with scientific evidence. Spiritual witnesses may reach beyond science, but they should not be confused with it.

From a scientific perspective, the Book of Mormon's origin is best situated in early nineteenth-century America, and Lamanite genesis can only be traced historically to ca. 1828.[96] The term Lamanite is a modern social and political designation that lacks a verifiable biological or historical underpinning linking it to ancient American Indians.[97] The Book of Mormon emerged from an antebellum perspective, out of a frontier American people's struggle with their god, and not from an authentic American Indian perspective. As Mormons, we have a moral and ethical obligation to discontinue this view of Native American origins and publicly disavow the offensive teaching that a dark skin is a physical trait of God's malediction.

In 1973, after weighing the archaeological evidence against the antiquity of the Book of Mormon, Michael Coe implored Latter-day Saints:

> Forget the so-far fruitless quest for Jaredites, Nephites, Mulekites, and the lands of Zarahemla and Bountiful; there is no more chance of finding them than of discovering the ruins of the bottomless pit described in the book of Revelations. ... Continue the praiseworthy excavations in Mexico, remembering that little or nothing pertaining to the Book of Mormon will ever result from them. And start digging into the archaeological remains of the Saints themselves.[98]

As we enter the twenty-first century, I would like to offer similar advice. We can continue our impressive genealogical research, and we should utilize the latest genetic technologies to enhance the precision and accuracy of our findings. But I believe that we should avoid a fruitless quest to tie Native American origins to the Middle East. There is as much chance of finding genetic proof of a Lehite civilization in the Americas as there would be of finding the Book of Mormon gold plates.

NOTES

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1. Jeffrey P. Haney, "Y. Researcher Curious about Your Bloodlines," *Deseret News,* 15 Aug. 2000; Lindsay Palmer and Roger Bryner, "Ethical Issues Surround DNA Research," *newsnet@BYU,* 28 Mar. 2000; Carolyn Peterson, "BYU's Genealogy-through-DNA Research Getting Boost from New DNA Research," *newsnet@BYU,* 28 June 2000; Allison Jones, "Y Molecular Group Works on Worldwide Family Tree," *newsnet@BYU,* 18 Nov. 2000. See also *http://molecular-genealogy.byu.edu.*

2. DNA analysis ignited public curiosity over whether Thomas Jefferson sired children with his slave Sally Hemings. See the online resources supplied by the Thomas Jefferson Foundation ("Jefferson-Hemings DNA Testing: An On-Line Resource" at *www.monticello.org*) and Philip W. Hendrick, *Genetics of Populations* (Sudbury, MA: Jones and Bartlett Publishers, 2000), 389-90.

3. The extent to which DNA analysis provides a portal to the past is illustrated in Bryan Sykes, *The Seven Daughters of Eve: The Science That Reveals Our Genetic Ancestry* (New York: W. W. Norton & Company, 2001).

4. Dan Egan, "BYU Gene Data May Shed Light on Origin of Book of Mormon's Lamanites," *Salt Lake Tribune,* 30 Nov. 2000; also Simon Southerton, "DNA Genealogies of American Indians and the Book of Mormon," 17 Mar. 2000, retrieved 20 Dec. 2000 from *www.exmormon.org*; Jonathan Higbee, "Where Is the Lamanite DNA?" retrieved 27 July 2000 from *www.geocities.com/Athens/Aegean/9636/tract/dna_additional.htm.* Despite a general lack of supporting evidence, at least one researcher at the Foundation for Ancient

Research and Mormon Studies (FARMS) has found reason for optimism in linguistic research. See Brian D. Stubbs, "Hebrew and Uto-Aztecan: Possible Linguistic Connections," *Reexploring the Book of Mormon*, ed. John W. Welch (Salt Lake City: Deseret Book and FARMS, 1992), 279-81.

5. While it is possible to find chance similarities at single loci, these have to be viewed within the larger picture. Kenneth K. Kidd et al., for example, report preliminary frequencies for three allele systems, observing that "[t]hese data make it clear that attempting to reach conclusions on population relationships from single loci is very risky. Roman Jews are most like Amazon Basin tribes in APOB and SST, but most like Cambodians at D20S5. Obviously, these gene frequency similarities cannot indicate close population affinities." Kenneth K. Kidd et al., "Nuclear DNA Polymorphism and Population Relationships," in *Genetic Diversity among Jews: Diseases and Markers at the DNA Level*, eds. Batsheva Bonné-Tamir and Avinoam Adam (New York: Oxford University Press, 1992), 37.

6. Southerton, "DNA Genealogies."

7. Robert Jurmain et al., *Introduction to Physical Anthropology* (8th ed.; Belmont, CA: Wadsworth, 2000), 44-45. Mitochondria are independent organisms living symbiotically in the human body within each and every human cell, although outside the nucleus. Since sperm consist only of nucleic material, mitochondria are transferred to the next human generation through the mother's egg cell.

8. Douglas Steinberg, "Genetic Variation Illuminates Murky Human History: Molecular Anthropologists Use DNA Markers to Chart Evolution and Migration," *The Scientist* 14[15] (July 2000): 10.

9. Jared Diamond, *The Third Chimpanzee: The Evolution and Future of the Human Animal* (New York: HarperCollins, 1992), 25.

10. See A. C. Wilson and V. M. Sarich, "A Molecular Time Scale for Human Evolution," *Proceedings of the National Academy of Sciences, USA* 63 (1969): 1088-93; and C. G. Sibley and J. E. Ahlquist, "The Phylogeny of the Hominid Primates as Indicated by DNA-DNA Hybridization," *Journal of Molecular Evolution* 20 (1984): 2-15, cited in Luigi Luca Cavalli-Sforza et al., *The History and Geography of Human Genes* (abridged ed.; Princeton, NJ: Princeton University Press, 1994), 86.

11. Michael D. Lemonick and Andrea Dorfman, "One Giant Step for Mankind: Meet Your Newfound Ancestor, a Chimplike Forest Creature That Stood Up and Walked 5.8 Million Years Ago," *Time*, 23 July 2001, 54-61.

12. Jurmain et al., *Introduction to Physical Anthropology*; Roger Lewin, *The Origin of Modern Humans* (New York: Scientific American Library, 1998). For an incisive new media presentation on human evolution, see the website "Becoming Human," *www.becominghuman.org*.

13. Allan C. Wilson and Rebecca L. Cann, "The Recent African Genesis of Humans: Genetic Studies Reveal That an African Woman of 200,000 Years Ago Was Our Common Ancestor," *Scientific American* (Apr. 1992), 68-73. For an alternative point of view, see Alan G. Thorne and Milford H. Wolpoff, "The Multiregional Evolution of Humans: Both Fossil and Genetic Evidence Argue that Various Human Groups Arose Where They Are Found Today," *Scientific American* (Apr. 1992), 76-83. See also Christopher B. Stringer, "The Emergence of Modern Humans," *Scientific American* (Dec. 1990), 98-104.

14. Robert S. Corruccini, "Reaganomics and the Fate of the Progressive Neanderthals," *Integrative Paths to the Past: Paleoanthropological Advances in Honor of F. Clark Howell*, eds. R. S. Corruccini and R. L. Ciochon (Englewood Cliffs, NJ: Prentice Hall, 1994), 697-708; Glenn C. Conroy, *Reconstructing Human Origins: A Modern Synthesis* (New York: Norton, 1997).

15. Max Ingham et al., "Mitochondrial Genome Variation and the Origin of Modern Humans," *Nature*, 7 Dec. 2000, 708-713; Cavalli-Sforza et al., *History and Geography of Human Genes*, 89.

16. Matthias Krings et al., "Neanderthal DNA Sequences and the Origin of Modern Humans," *Cell* 90 (1997): 19-30; Ryk Ward and Chris Stringer, "A Molecular Handle on the Neanderthals," *Nature*, 17 July 1997, 225-26; Igor V. Ovchinnikov et al., "Molecular Analysis of Neanderthal DNA from the Northern Caucasus," *Nature*, 30 Mar. 2000, 490-93.

17. Alan R. Templeton, "Out of Africa Again and Again," *Nature*, 7 March 2002, 45-51.

18. Luigi Luca Cavalli-Sforza, *Genes, Peoples, and Languages* (New York: North Point Press, 2000), 61-63. For a discussion that dates the first migration as early as 15,000 years ago, see Ryk Ward, "Language and Genes in the Americas," *The Human Inheritance: Genes, Language, and Evolution*, ed. Bryan Sykes (Oxford: Oxford University Press, 1999), 135-57.

19. Anthony Pagden, *European Encounters with the New World* (New Haven, CT: Yale University Press, 1993); Stephen Greenblatt, *Marvelous Possessions: The Wonder of the New World* (Chicago: University of Chicago Press, 1991); Fernando Cervantes, *The Devil in the New World* (New Haven, CT: Yale University Press, 1994); Elsa Cecilia Frost, "Indians and Theologians: Sixteenth-Century Spanish Theologians and Their Concept of the Indigenous Soul," *South and Meso-American Native Spirituality: From the Cult of the Feathered Serpent to the Theology of Liberation*, ed. Gary H. Gossen (New York: Crossroad Publishing Company, 1993), 119-39.

20. Thomas Paine, *The Age of Reason*, Part I (New York: Macmillan Publishing Company, 1957 [1794]).

21. Robert N. Hullinger, *Joseph Smith's Response to Skepticism* (Salt Lake City: Signature Books, 1992). As Ed Ashment kindly reminded me, the Book of Mormon is far more than a response to skepticism; it is also "a condemnation of Masonry; a theory of the origin of the Amerindians, all of them; a condemnation of biblical polygamy; an assertion that Christianity always was, that it did not evolve out of Judaism; a declaration of a homousian trinity; an advocate of predestination (cloaked as 'foreknowledge'); etc." (private communication).

22. Joseph Smith, "Church History," *Times and Seasons* 3 (Mar. 1842): 706-710, in Dean C. Jessee, ed., *The Papers of Joseph Smith, Volume 1: Autobiographical and Historical Writings* (Salt Lake City: Deseret Book, 1989), 437.

23. John L. Brooke, *The Refiner's Fire: The Making of the Mormon Cosmology* (New York: Cambridge University Press, 1994), 198. For a more sustained argument for Joseph Smith's literalism and its implications, see William D. Russell, "Beyond Literalism," in *The Word of God: Essays on Mormon Scripture*, ed. Dan Vogel (Salt Lake City: Signature, 1990), 43-54.

24. David H. Bailey, "Science and Mormonism: Past, Present, Future," *Dialogue: A Journal of Mormon Thought* 29 (Spring 1996): 80-96.

25. Although not published until well after his death, the best example of Roberts's apologia in this regard is Brigham H. Roberts, *The Truth, the Way, the Life: An Elementary Treatise on Theology* (San Francisco: Smith Research Associates, 1994).

26. Bailey, "Science and Mormonism," 82-83.

27. Armand L. Mauss, *The Angel and the Beehive: The Mormon Struggle with Assimilation* (Urbana: University of Illinois Press, 1994).

28. Bailey, "Science and Mormonism," 85.

29. The personal struggles of two LDS professors at Idaho State University are outlined in a new book; see Trent D. Stephens and D. Jeffrey Meldrum, *Evolution and Mormonism: A Quest for Understanding* (Salt Lake City: Signature Books, 2001). They participated with me on a panel discussion, "DNA and Lamanite Identity: A Galileo Event," moderated by Brent Metcalfe at the 2001 Salt Lake City Sunstone Symposium.

30. Pope John Paul II, "Message to the Pontifical Academy of Sciences," cited in Stephens and Meldrum, who themselves use the pope's embrace of evolution to illustrate the need to "change our thinking and world views" in light of "new and accumulating scientific data" (Stephens and Meldrum, *op. cit.*, 79-80).

31. Overviews of some of the latest archaeological research into Native American origins include Robson Bonnichsen and D. Gentry Steele, *Method and Theory for Investigating the Peopling of the Americas* (Corvallis, OR: Center for the Study of the First Americans, 1994); Robson Bonnichsen and Karen L. Turnmire, *Ice Age Peoples of North America: Environments, Origins, and Adaptations of the First Americans* (Corvallis, OR: Oregon State University Press, 1999); Thomas D. Dillehay, *The Settlement of America: A New Prehistory* (New York: Basic Books, 2000). For a critique of archaeology from a Native American perspective, see Vine Deloria Jr., *Red Earth, White Lies: Native Americans and the Myth of Scientific Fact* (New York: Scribner, 1995).

32. Michael Coe, "Mormons and Archaeology: An Outside View," *Dialogue: A Journal of Mormon Thought* 8 (Summer 1973): 40-48. See also Edward H. Ashment, "'In the Language of My Father': Evidence of Ancient Egyptian and Hebrew in the Book of Mormon," in *New Approaches to the Book of Mormon: Explorations in Critical Methodology*, ed. Brent Lee Metcalfe (Salt Lake City: Signature Books, 1993), 329-93.

33. Dee F. Green, "Book of Mormon Archaeology: The Myths and the Alternatives," *Dialogue: A Journal of Mormon Thought* 4 (Summer 1969): 71-80; Deanne G. Matheny, "Does the Shoe Fit? A Critique of the Limited Tehuantepec Geography," in *New Approaches to the Book of Mormon*, 269-328. See also Hampton Sides, "This Is Not the Place," *DoubleTake* 5 (Spring 1999): 46-55.

34. B. H. Roberts, *Studies of the Book of Mormon*, ed. Brigham D. Madsen (Salt Lake City: Signature Books, 1992); Stan Larson, *Quest for the Gold Plates: Thomas Stuart Ferguson's Archaeological Search for the Book of Mormon* (Salt Lake City: Freethinker Press and Smith Research Associates, 1996). On the other hand, organizations such as FARMS regularly publicize works they believe validate ancient claims.

35. Egan, "BYU Gene Data."

36. Suzan Mazur, "Mormons in the Olympic Spotlight: Polygamy and Scripture Threaten to Steal Some of the Thunder from the Winter Games in Utah," *Financial Times*, 9 Feb. 2002, retrieved 10 Feb. 2002 from *http://globalarchive.ft.com*.

37. Michael Crawford, *The Origins of Native Americans: Evidence from Anthropological Genetics* (New York: Cambridge University Press, 1998), 3-4. He provides an incisive perspective, though he omits some recent research and focuses primarily on North American native populations.

38. "Introduction," *The Book of Mormon: Another Testament of Jesus Christ* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1981).

39. Crawford, *The Origins of Native Americans*, 4-7.

40. See D. C. Wallace et al., "Dramatic Founder Effects in Amerindian Mitochrondrial DNAs," *American Journal of Physical Anthropology* 68 (1985): 149-55; and T. G. Schurr et al., "Amerindian Mitochrondrial DNAs Have Rare Asian Mutations at High Frequencies Suggesting a Limited Number of Founders," *American Journal of Human Genetics* 46 (1990): 613-23, cited in Antonio Torroni, "Mitochrondrial DNA and the Origin of Native Americans," *America Past, America Present: Genes and Languages in the Americas and Beyond*, ed. Colin Renfrew (Cambridge, UK: McDonald Institute for Archaeological Research, 2000), 77-87.

41. Torroni, "Mitochrondrial DNA," 79.

42. Joseph Greenberg, *Language in the Americas* (Stanford, CA: Stanford University Press, 1987).

43. See Cavalli-Sforza et al., *History and Geography of Human Genes*; Cavalli-Sforza, *Genes, Peoples, and Languages*.

44. See Renfrew, *America Past, America Present*.

45. Cavalli-Sforza, *Genes, Peoples, and Languages*, 136.

46. Ibid.

47. Sykes, *Seven Daughters of Eve*, 281-83.

48. Torroni, "Mitochrondrial DNA," 81-83.

49. Ibid., 85.

50. Michael D. Brown et al., "mtDNA Haplogroup X: An Ancient Link between Europe/Western Asia and North America?" *American Journal of Human Genetics* 63 (Dec. 1998): 1852-61.

51. Torroni, "Mitochrondrial DNA," 81-83.

52. Theodore G. Schurr, "Mitochondrial DNA and the Peopling of the New World," *American Scientist* 88/3 (2000): 246-53.

53. Brown et al., "mtDNA Haplogroup X," 1852.

54. Sykes, *Seven Daughters of Eve*, 213-20, 274, 281.

55. See John L. Sorenson, *An Ancient American Setting for the Book of Mormon* (Salt Lake City: Desert Book Company, 1996), for an argument for a limited geography and summary of the hemispheric view. For an example of LDS interest in haplogroup X, see Jeff Lindsay, "Genes Linking Eurasians and Native Americans," retrieved 20 Dec. 2000 from *www.jefflindsay.com*.

56. "Problematic Role of DNA Testing in Unraveling Human History," *Journal of Book of Mormon Studies* 9/2 (2000): 69-70.

57. See Schurr, "Mitochondrial DNA," 246.

58. Miroslava V. Derenko et al., "The Presence of Mitochondrial Haplogroup X in Altaians from South Siberia," *American Journal of Human Genetics* 69 (July 2001): 237.

59. Mazur, "Mormons in the Olympic Spotlight."

60. Genetic inheritance can actually be more complex than simply XX or XY, and many intersexed individuals inherit different variations of up to four X and Y chromosomes. For an interesting commentary on the U.S. medical response to such ambiguity, see Martha Coventry, "Making the Cut: It's a Girl! ... Or Is It? When There's Doubt, Why Are Surgeons Calling the Shots?" *Ms Magazine,* Oct./Nov. 2000, retrieved 20 Dec. 2000 from *www.msmagazine.com*.

61. E. S. Poloni et al., "Human Genetic Affinities for Y-Chromosome P49a,f/Taq I Haplotypes Show Strong Correspondence with Linguistics," *American Journal of Human Genetics* 61 (Nov. 1997): 1015-35.

62. L. B. Jorde et al., "The Distribution of Human Genetic Diversity: A Comparison of Mitochrondrial, Autosomal, and Y-Chromosome Data," *American Journal of Human Genetics* 66 (Mar. 2000): 979-88.

63. Fabrício Santos et al., "The Central Siberian Origin for Native American Y Chromosomes," *American Journal of Human Genetics* 64 (Feb. 1999): 619-28; Nestor Bianchi et al., "Origin of Amerindian Y-Chromosomes as Inferred by the Analysis of Six Polymorphic Markers," *American Journal of Physical Anthropology* 102 (Jan. 1997): 79-89.

64. T. M. Karafet et al., "Ancestral Asian Source(s) of New World Y-Chromosome Founder Haplotypes," *American Journal of Human Genetics* 64 (Mar. 1999): 817-31.

65. Bernd Herrmann and Susanne Hummel, eds., *Ancient DNA* (New York: Springer, 1994).

66. Shawn W. Carlyle et al., "Context of Maternal Lineages in the Greater Southwest," *American Journal of Physical Anthropology* 113 (Sept. 2000): 85-101; Dennis H. O'Rourke et al., "Ancient DNA: Methods, Progress, and Perspectives," *American Journal of Human Biology* 8/5 (1996): 557-71.

67. Carlyle et al., *op. cit.*; O'Rourke et al., "Ancient DNA," 557-71; Ryan L. Parr et al., "Ancient DNA Analysis of Fremont Amerindians of the Great Salt Lake Wetlands," *American Journal of Physical Anthropology* 99 (Apr. 1996): 507-518; Anne C. Stone and Mark Stoneking, "mtDNA Analysis of a Prehistoric Oneota Population: Implications for the Peopling of the New World," *American Journal of Human Genetics* 62 (Apr. 1998): 1153-70.

68. D. Andrew Merriwether et al., "Ancient and Contemporary Mitochrondrial DNA Variation in the Maya," in *Bones of the Maya: Studies of Ancient Skeletons*, eds. Stephen L. Whittington and David M. Reed (Washington: Smithsonian Institution Press, 1997), 208-217.

69. Cavalli-Sforza, *Genes, Peoples, and Languages*; Cavalli-Sforza et al., *History and Geography of Human Genes*; Sykes, *Seven Daughters of Eve*; Templeton, "Out of Africa."

70. Nathan A. Ellis, "The Ashkenazic Jewish Bloom Syndrome Mutation blmAsh Is Present in Non-Jewish Americans of Spanish Ancestry," *American Journal of Human Genetics* 63 (Dec. 1998): 1685-93; Luis Carvajal-Carmona et al., "Strong Amerind/White Sex Bias and a Possible Sephardic Contribution among the Founders of a Population in Northwest Colombia," *American Journal of Human Genetics* 67 (Nov. 2000): 1287-95. For an intriguing account of the Castilian Christian attempts to expel Jewish and Muslim heterogeneity from the Iberian peninsula and their tendency to treat indigenous Americans as Jews and Moors (with implications for the quest for Amerisraelites), see Tzetvan Todorov, *The Conquest of America* (New York: HarperPerennial, 1984). See Bonné-Tamir and Adam, eds., *Genetic Diversity among Jews*.

71. Sorenson, *An Ancient American Setting*, 93. See also Connie Kolman and Noreen Tuross, "Ancient DNA Analysis of Human Populations," *American Journal of Physical Anthropology* 111 (Jan. 2000): 5-23.

72. Neil Bradman et al., "The Genetic Origins of Old Testament Priests," *America Past, America Present*, 31-44.

73. See Neil Bradman and Mark Thomas, "Why Y? The Y Chromosome in the Study of Human Evolution, Migration, and Prehistory," *Science Spectra* 14 (1998).

74. Bradman and Thomas, "Why Y?"; Mark G. Thomas et al., "Y Chromosomes Traveling South: The Cohen Modal Haplotype and the Origins of the Lemba, the 'Black Jews of Southern Africa,'" *American Journal of Human Genetics* 66 (Feb. 2000): 674-86.

75. Michael F. Hammer et al., "Jewish and Middle Eastern Non-Jewish Populations Share a Common Pool of Y-chromosome Biallelic Haplotypes," *Proceedings of the National Academy of Sciences USA*, 97 (June 2000): 6769-6774.

76. Mazur, "Mormons in the Olympic Spotlight."

77. See "Introduction," *The Book of Mormon*.

78. Interested Latter-day Saints can follow the debate in *Brigham Young University Studies, Dialogue: A Journal of Mormon Thought, FARMS Review of Books, Journal of Book of Mormon Studies*, and *Sunstone*. Online resources can be found at *farmsresearch.com, mormoncentral.com, mormonscripturestudies.com*, and *religioustolerance.org/lds_migr.htm*. Key examples of the debate among LDS scholars are Metcalfe, ed., *New Approaches to the Book of Mormon;* Roberts, *Studies of the Book of Mormon*; Sorenson, *An Ancient American Setting*; Vogel, ed., *The Word of God*; Noel B. Reynolds, ed., *Book of Mormon Authorship Revisited: The Evidence for Ancient Origins* (Provo, UT: FARMS, 1997); and Mark D. Thomas, *Digging in Cumorah: Reclaiming Book of Mormon Narratives* (Salt Lake City: Signature Books, 1999).

79. Sorenson, *An Ancient American Setting*, 55. For an archaeological critique of this perspective, see Matheny, "Does the Shoe Fit? A Critique of the Limited Tehuantepec Geography," in *New Approaches to the Book of Mormon*, 269-328. See also Dennis Tedlock, trans., *Popol Vuh* (New York: Touchstone, 1996). For discussions of Mormon Maya and Ladino interpretations of the Popol Vuh and Book of Mormon, see Thomas W. Murphy, "Reinventing Mormonism: Guatemala as a Harbinger of the Future?" *Dialogue: A Journal of Mormon Thought* 29 (Spring 1996): 177-92.

80. William J. Hamblin, "An Apologist for the Critics: Brent Lee Metcalfe's Assumptions and Methodologies," *Review of Books on the Book of Mormon* 6/1 (1994): 476.

81. Sorenson, *An Ancient American Setting*, 93-94.

82. See Shaye J. D. Cohen, *The Beginnings of Jewishness: Boundaries, Varieties, Uncertainties* (Berkeley: University of California Press, 1999); E. Theodore Mullen Jr., *Ethnic Myths and Pentateuchal Foundations: A New Approach to the Formation of the Pentateuch* (Atlanta, GA: Scholar's Press and the Society of Biblical Literature, 1997); E. Theodore Mullen Jr., *Narrative History and Ethnic Boundaries: The Deutoronomistic Historian and the Creation of Israelite National Identity* (Atlanta, GA: Scholars Press and the Society of Biblical Literature, 1993).

83. "The Problematic Role of DNA Testing in Unraveling Human History," *Journal of Book of Mormon Studies* 9/2 (2000): 66-74.

84. Sykes, *The Seven Daughters of Eve*, 101. The anonymous FARMS writer seems unaware of recent advancements on the question of whether Native Americans migrated to Polynesia. Matthew E. Hurles and colleagues, including Bryan Sykes, whom the FARMS author cites with approval, note that their study of Polynesian Y-chromosomes provided "no evidence for a Native American contribution to the Polynesian Y-chromosomal pool" (M. E. Hurles et al., "European Y-Chromosomal Lineages in Polynesians: A Contrast to the Population Structure Revealed by mtDNA," *American Journal of Human Genetics* 63 [Dec. 1998]: 1793-1806). See also Martin Richards et al., "mtDNA Suggests Polynesian Origins in Eastern Indonesia," *American Journal of Human Genetics* 63 (Oct. 1998): 1234-37. Of course, even if such evidence did exist, the common Polynesian and Amerindian genetic markers are still of Asiatic origin.

85. Cooper Johnson, "DNA and the Book of Mormon," retrieved 3 April 2002, *www.fair-lds.org/apol/bom/bom01.html.*

86. Scott Woodward to Tom Murphy, "Re: Clarification of FAIR Article," personal email, 9 Apr. 2002.

87. D. H. O'Rourke et al., "Spatial and Temporal Stability of mtDNA Haplogroup Frequencies in Native North America," *Human Biology* 72/1 (2000): 15-34.

88. Hammer et al., "Jewish and Middle Eastern Non-Jewish Populations."

89. A panel of LDS biologists and anthropologists, Trent D. Stephens, D. Jeffrey Meldrum, and myself, more explicitly emphasized the need to jettison the Lamanite ancestry claim for American Indians at the 2001 Salt Lake City Sunstone Symposium ("DNA and Lamanite Identity: A Galileo Event").

90. Copies of statements from the SAIIC as well as responses from participants in HGDP can be found at "Native Net, Human Genome Diversity Project Articles from Native-L, "retrieved 5 Sept. 2000 from *http://nativenet.uthsca.edu/nl/hgdp.html.* See also Morrison Institute for Population and Resource Studies, "Human Genome Diversity Project Frequently Asked Questions," retrieved 8 Sept. 2000 from *www.Stanford.edu/group/morrinst/ hgdp/faq.html.*

91. Martin Johnston, "Mormons Trigger NZ Ethical Concern over DNA," *The New Zealand Herald,* 17 May 2001, retrieved 19 May 2001 from *www.nzherald.com*; Kent Larsen, "BYU Molecular Genealogy Research Project Accused of Ethical Lapse in New Zealand," *Mormon News,* 18 May 2001, retrieved 19 May 2001 from *www.mormonstoday.com.*

92. Jace Weaver, "Missions and Missionaries," in Mary B. Davis, ed., *Native America in the Twentieth Century: An Encyclopedia* (New York: Garland Publishing, 1994), 348.

93. Suzan Mazur, "Mormon Scriptures on Indians Show Objectionable Side of Olympic Hosts," *Indian Country Today*, 21 Feb. 2002, retrieved 22 Feb. 2002 from *www.indiancountry.com.*

94. I have raised similar concerns in several publications. See my "Reinventing Mormonism," 177-92; "Laban's Ghost: On Writing and Transgression," *Dialogue: A Journal of Mormon Thought* 30 (Summer 1997), 105-126; "From Racist Stereotype to Ethnic Identity: Instrumental Uses of Mormon Racial Doctrine," *Ethnohistory* 46/3 (1999): 451-80; and "Other Mormon Histories: Lamanite Subjectivity in Mexico," *Journal of Mormon History* 26 (Fall 2000): 179-215.

95. Sorenson, *An Ancient American Setting*, 94.

96. See Doctrine and Covenants 3:18-20.

97. For examples of post-1828 historical and social uses of the label Lamanite, see my "Reinventing Mormonism," "Laban's Ghost," "From Racist Stereotype," and "Other Mormon Histories."

98. Coe, "Mormons and Archaeology," 48.